

BRYOZOA FROM TOYAMA BAY, SEA OF JAPAN

KATUHIKO SAKAKURA (坂倉 勝彦)

Geological Institute, Tokyo Imperial University

ONE PLATE AND TWO TEXTFIGURES

(Received Mar. 4, 1935)

Professor K. Kikuchi of Toyama High School presented to me for study some specimens of bryozoa which he had dredged from Toyama Bay in his course of biological researches. As his purposes of dredging were mainly to collect molluscs, the bryozoan specimens secured are rather small in number and may probably represent only a part of the fauna of the bay.

Until now, the bryozoa of the Sea of Japan were but little known. With the exception of some bryozoa collected near Maiduru by Döderlein and described by Ortmann, our knowledge has somewhat advanced only at both of northeastern and southwestern extremities of the Sea of Japan, thanks to the investigations made by Professor Y. Okada. Therefore, interest of the present study on the fauna of Toyama Bay depends on the fact that it may contain some typical elements of the Sea of Japan.

I take this opportunity to express my sincere thanks to Professor Yaichiro Okada for his kindness in revising the manuscript of this paper, and to Professor Kanzaemon Kikuchi who generously sent to me the valuable materials.

DESCRIPTIONS OF SPECIES

Order Cheilostomata Busk

Suborder Anasca Levinsen

Family Aeteidæ

1. *Aetea truncata* Landsborough

Aetea truncata Harmer, 1926. The Polyzoa of the Siboga Expedition, Pt. II. Cheilostomata Anasca, p. 196, pl. 13, figs., 5-7; Hastings, 1930. Cheilostomatous Polyzoa from the vicinity of the Panama Canal. Proc. Zool. Soc. Part 4, 1929. p. 702.

Depth. 70-100 fms.

Distr. Cosmopolitan.

Reg. No. e-T-4.

2. *Nitcheina tuberculata* (Busk)

Nichtina tuberculata Harmer, 1926. Loc. cit. p. 208, pl. 13, fig. 10; Hastings, 1930.

Loc. cit. p. 706, pl. 3, figs. 9, 10; Okada, 1934. Bryozoa fauna in the vicinity of the Shimoda Marine Biological Station. Sci. Rep. Tokyo Univ. Liter. & Sci. sect. B, vol. 2, no. 26. p. 3, pl. 1, fig. 1.

Nitscheina tuberculata Canu and Bassler, 1929. Bryozoa of the Philippine region. Bull. U. S. Nat. Mus. 100, p. 80, pl. 5, fig. 6.

One colony encrusting a kelp.

Distr. Atlantic, Indian Ocean, Philippine region, Patagonia, California, Vancouver, Japan.

Reg. No. e-T-13.

Family Alderinidæ

3. *Tegella crenulata* (Okada)

Ellisina crenulata Okada, 1929. Cheilostomatous Bryozoa of Mutsu Bay. Sci. Rep. Tôhoku Imperial University 4th ser., Biology, vol. 4, no. 1. fasc. 1. p. 12, pl. 4, fig. 1.

An ovicelled specimen encrusting *Macra sachalinensis* was obtained. The ovicell is hyperstomial, transverse, subrectangular and provided with a transverse ridge. There are two lateral multiporous rosette-plates.

Depth. 100 fms.

Distr. Mutsu Bay.

Reg. No. e-T-2.

4. *Tegella unicornis* (Fleming)

Tegella unicornis Levinsen, 1909. Morphological and systematic studies on the Cheilostomatous Bryozoa. Copenhagen. p. 152.

Membranipora unicornis Osburn, 1912. The Bryozoa of the Woods Hole region. Bull. of the Bureau of Fisheries, vol. 25. p. 230 pl. 23, fig. 35.

Only one colony encrusting a shell of *Lementina* sp. The opesia are broad and finely crenulated; their proximal area, sometimes, are fairly well developed. The zooecia which do not contain avicularium are not rare.

Depth. Unknown (? 30 fms.).

Distr. Atlantic (east and north), North Sea.

Reg. No. e-T-7.

5. *Amphiblestrum canui* Sakakura

Amphiblestrum canui Sakakura, 1935. Pliocene and Pleistocene Bryozoa from the Bôsô Peninsula (I) Jour. Fac. Sci., Univ. Tokyo, sect. 2, vol. 4, pt. 1. p. 9, pl. 1, fig. 9, textfig. 1.

One colony only encrusting a coral. Specimens of this species were abundantly collected from the Pleistocene strata of Bōsō Peninsula. The specimen of Toyama Bay agrees well with them in all points.

Depth. 30-50 fms.

Reg. No. 3-T-5 (5).

Family Arachnopusiidæ

6. *Arachnopusia?* *kikuchii* sp. nov. (Pl. 8, fig. 1)

The zoarium encrusts stones. The zooecia are very large, a little elongated, distinct, separated by deep furrows. The frontal is remarkably convex and very porous. The aperture is large, orbicular; the lower lip of the peristome is raised and pointed. The operculum is semicircular; its lower part is sometimes bent interiorly. There are two multiporous rosette-plates on each lateral wall. The avicularium is wanting.

Dimensions (mm) Length of zooecium = 1.00 - 1.25

Width of zooecium = 0.50 - 0.76 (0.66 common)

Diameter of aperture = 0.38

The size is the most characteristic feature. So far as I am aware, I could not find out any described form safely identifiable with this species. Though I ranked this species under the genus *Arachnopusia* Jullien¹, its generic affinity should be revised in a future collection.

Depth. 100-150 fms.

Reg. No. e-T-4 (b).

Family Cellariidæ

7. *Cellaria triangularis* Ortmann

Cellaria triangularis Ortmann, 1889. Die japanische Bryozoenfauna. Archiv für Naturgeschichte. 1890. p. 32, pl. 2, fig. 13; Okada, 1934. Loc. cit. p. 11, pl. 1, fig. 8; Sakakura, 1935. Loc. cit. p. 15.

Depth. Unknown.

Distr. Hokkaido, Honsyû, Kyûsyû (Japan).

Geol. range. Pliocene-Recent (Japan).

Reg. No. e-T-13.

Family Scrupocellariidæ

8. *Caberea lata* Busk

Caberea lata Harmer, 1926. Loc. cit. p. 360, pl. 24, figs. 7-9; Okada, 1934. Loc. cit. p. 7.

¹ Type. *Lepralia monoceros* (Busk).

BBYOZOA FROM TOYAMA BAY

109

Depth. Unknown.

Distr. Indo-Pacific Ocean, Australia, Tusima and Pacific coast of Honsyû (Japan).

Reg. No. e-T-11.

9. *Caberea boryi* (Audouin)

Caberea boryi Harmer, 1926. Loc. cit. p. 362, pl. 24, figs. 13-15.

Depth. Unknown.

Distr. Queensland, Indian Ocean, Netherland East-Indies, Madeira, Mediterranean, Japan.

Reg. No. e-T-13.

10. *Caberea hataii* Okada

Caberea hataii Okada, 1929. Loc. cit. p. 13, pl. 1, fig. 2; pl. 4, fig. 2; textfig. 2.

The zoarium is brown in color. The ovicell is quadrangular, formed of a flat area and well calcified raised margins.

In my specimens, the scutum is more developed than that of Mutsu Bay figured by Okada.

Depth. Unknown.

Distr. Mutsu Bay.

Reg. No. e-T-12.

11. *Amastigia rufis* (Busk)

Caberea rufis Busk, 1852. Catalogue of marine Polyzoa in the collection of the British Museum, Part. 1. Cheilostomata. p. 38, pl. 46, figs. 1-3.

Amastigia rufis Harmer, 1926. Loc. cit. p. 349, pl. 23, figs. 9-13 (Bibliography): Okada, 1934. Loc. cit. p. 9, pl. 1, fig. 6.

Depth. 100-150 fms.

Distr. Queensland, Victoria, Netherland East Indies, Japan.

Reg. No. e-T-10.

Family Cribrilinidæ.

12. *Lyrula multipora* sp. nov. (Pl. 8, fig. 7)

The zoarium encrusts corals. The zooecia are distinct, separated by furrows, arranged somewhat linearly. The opesium is semicircular; its latero-distal especially, and proximal margins are raised as seen in some cribrimorph Cheilostomata. The costules are about 13 in number, provided with one large lumen pore near the end and one smaller pore, situated more centrally. The lacunæ are small, 6 to 8 in number. The ovicell is inflated, globose or subpentagonal, more or less carinated and perforated by the scattered pores. The latter, placed

marginally, are distinct and large. There are about 3 lateral pore-chambers.

Dimensions (mm)	Length of zooecium = 0.66 - 0.73
	Width of zooecium = 0.33 - 0.36
	Height of opesum = 0.12 - 0.13
	Width of opesum = 0.20 - 0.22

This new species is distinguished from *Lyrula hippocrepis* (Hincks)² which has no lumen pore but one on the costules.

Lyrula multipora sp. nov. which occurs as fossil in the Pleistocene strata of Bōsō Peninsula, bears not rarely the 3rd lumen pore at the inner extremity of the costules.

Depth. 100-150 fms.

Reg. Nos. e-T-2 (2); e-T-3 (2).

13. *Figularia* cfr. *jucunda* Canu and Bassler

Figularia jucunda Canu and Bassler, 1929. Loc. cit. p. 241, pl. 22, fig. 3.

A small colony consisting of only several zooecia was obtained. It encrusts a shell of *Paphia*.

Though the avicularium and ovicell are not preserved, its zooecial characters coincide well with the description of *Figularia jucunda*.

Depth. 100 fms.

Distr. Philippine region.

Reg. No. e-T-3 (3)

Suborder Ascophora

Family Hippothoidæ

14. *Hippothoa flagellum* Manzoni

Hippothoa flagellum Canu and Bassler, 1929. Loc. cit. p. 247, pl. 22, fig. 7; Sakakura, 1935. Loc. cit. p. 18.

Depth. 30-50 fms.

Distr. Cosmopolitan.

Reg. No. e-T-5.

Family Petraliidæ

15. *Petraliella ellerii* var. *japonica* (Ortmann) (Pl. 8, fig. 3)

Mucronella ellerii MacGillivray var. *japonica* Ortmann, 1889. Loc. cit. p. 46, pl. 3, fig. 27.

² *Cribrilina hippocrepis* Hincks, Polyzoa Queen Ch. Isl. Ann. Mag. Nat. Hist., (5), pl. 15, fig. 6, 1882.

The zoarium encrusts a solitary coral; it is yellowish brown in color. The tremopores are large and give to the frontal a reticulated appearance. The ovicell is also perforated, but by the pores a little smaller than the frontal tremopores.

Dimensions (mm) Length of zooecium = 0.66
 Width of zooecium = 0.30
 Height of aperture = 0.13
 Width of aperture = 0.18

Depth. Unknown.

Distr. Sagami Bay.

Reg. No. e-T-8.

16. '*Petraliella*' sp.

The zoarium encrusts a shell of *Mactra sulcataaria*. The zooecia are small, indistinct. The frontal is flat, perforated by large tremopores. The aperture is semicircular, transverse, with a proximal margin which bears a lyrula-like projection.

Dimensions (mm) Length of zooecium = 0.50
 Width of zooecium = 0.33
 Height of aperture = 0.10
 Width of aperture = 0.13

Only one dead colony was obtained. The avicularium and the ovicell were not found.

It resembles *Cigclisula occlusa* (Busk) figured by Canu and Bassler³ in the frontal features; it is also allied in some respects to species of *Cyclocolposa* Canu and Bassler⁴. But it is distinguished from them in the presence of a lyrula-like projection. If the latter is a true lyrula, the present species must be placed in another genus, e. g. in *Smittina*.

Depth. 100-150 fms.

Reg. No. e-T-2 (9).

Family Escharellidæ

17. *Schizoporella costulata* Canu and Bassler var. *distincta* Sakakura

Schizoporella costulata var. *distincta* Sakakura, Loc. cit. p. 19, pl. 3, figs. 4, 5.

Distr. of *S. costulata* Canu and Bassler. Jolo Light, Jolo; Romblon Light, Romblon.

³ Canu and Bassler, 1929. Loc. cit. pl. 31, figs. 3-10.

⁴ Do. 1923. North American Later Tertiary and Quaternary Bryozoa. Bull. U. S. Nat. Mus. 125. p. 135.

Geol. Occ. Pleistocene (Bōsō Peninsula).

Reg. No. e-T-10.

18. *Arthropoma cecili* (Audouin)

Arthropoma cecili Canu and Bassler, 1929. Loc. cit. p. 296, pl. 32, fig. 1.

Depth. 100 fms.

Distr. Cosmopolitan.

Reg. No. e-T-1 (1).

19. *Stephanosella indistincta* Canu and Bassler

Stephanosella indistincta Canu and Bassler, 1929. Loc. cit. p. 314, pl. 35, figs. 7, 8.

Besides the transverse avicularium described by Canu and Bassler, another similar in size and shape occurs sometimes on the mucro, on the frontal. There are small scattered areolar pores in my specimen.

Depth. 150 fms.

Distr. Cape Tsiuka, Sea of Japan (Canu and Bassler).

Reg. No. E-T-9.

20. *Lacerna hosteensis* Jullien (Pl. 8, fig. 4)

Lacerna hosteensis Jullien, 1888. Mission scientifique du Cap Horn. Bryozoaires. p. 48, pl. 1, fig. 2.

A single colony encrusting *Balanophyllia* sp. was examined. The ovicell is wanting, but the other zoocial characters coincide well with the description of this species.

Depth. 30-50 fms.

Distr. Antarctic.

Reg. No. e-T-6.

21. *Schizopodrella ternata* (Ortmann)

Schizoporella ternata Ortmann, 1889. Loc. cit. p. 48, pl. 3, fig. 34.

Schizoporella ternata Sakakura, 1935. Loc. cit. p. 20, pl. 3, figs. 2, 3.

Some ovicelled specimens were also obtained.

Depth. 100-150 fms.

Distr. Sagami Bay.

Geol. Occ. Pleistocene of Bōsō Peninsula.

Reg. Nos. e-T-2; e-T-3.

22. *Emballotheca incisa* (Busk) (Pl. 8, figs. 5, 6; textfig. 1)

Lepralia incisa Busk, 1884. Report on the Polyzoa—The Cheilostomata. H.M.S. Challenger. vol. 10, part. 30, p. 145, fig. 42.

The zoarium encrusts stones. The zoocia are large, distinct, separated by thin threads. The frontal is more or less convex, consisting of perforated tremocyst. The aperture is transverse, subquadangular, contracted proximally, with a wide rimule and bears two distinct car-

delles. The oral avicularium is small, elliptical, placed on one or both lateral sides of the aperture (or lacking entirely) and directed obliquely and distally. The ovicell is hyperstomial, orbicular, buried in the distal zooecium and perforated like the frontal. There are uniporous rosette-plates less than 10 on one side.

Dimensions (mm)

Length of zooecium = 0.50 - 0.67
 Width of zooecium = 0.84 - 1.00
 Height of aperture = 0.17 - 0.20
 Width of aperture = 0.22 - 0.25

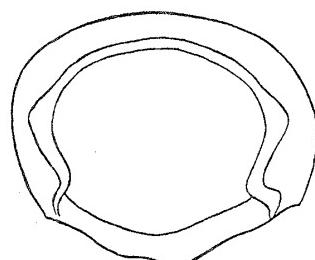


Fig. 1. *Emballotheca incisa*
(Busk) ca. $\times 100$.

This species is characterized by its large size and the position of the oral avicularium. In these points, it is easily distinguished from *Emballotheca acutirostris* Canu and Bassler, etc. In Busk's figure the cardelles are not seen and the aperture is lesser transverse than that of the present specimen.

Depth. 70-100 fms.

Distr. Inaccessible Is. 60-90 fms. (Busk).

Reg. No. e-T-4 (c).

23. *Emballotheca* cfr. *pellucida* (Ortmann) (Pl. 8, fig. 2; textfig. 2)

Schizoporella pellucida Ortmann, 1889. Loc. cit. p. 50, pl. 4, fig. 1.

The zoarium, encrusting shells or corals, is purplish in color. The zooecia are elongated, subrectangular, distinct, separated by thin threads and arranged linearly. The frontal is slightly convex and of perforated

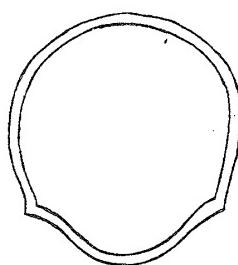


Fig. 2. *Emballotheca*
pellucida (Ortmann)
ca. $\times 100$.

Dimensions (mm)

Length of zooecium = 0.07 - 0.08
 Width of zooecium = 0.33 - 0.42
 Height and width of aperture = 0.15

The operculum (textfig. 2) is brown; the ancestrula is tata-form. So far as Ortmann's description and illustration are concerned, his species differs from mine in such respects that the aperture is smaller and the avicularium is located at some distance from the aperture. Therefrom I hesitate to identify our specimens exactly.

Depth. 30-100 fms.

Dist. Sagami Bay (40-200 fms.) and Maiduru (35-40 fms.) (Ortmann).

Reg. Nos. e-T-1 (3); e-T-5 (1).

24. *Microporella ciliata* (Audouin)

Microporella ciliata Sakakura 1935. Loc. cit. p. 25.

Distr. Cosmopolitan.

Reg. Nos. e-T-1 (3, 7); 2 (5, 12); 3 (7, 16).

25. *Smittina trispinosa* (Johnston)

Smittina trispinosa Canu and Bassler, 1929. Loc. cit. p. 341 (typical form).

Depth. 100 fms.

Reg. No. e-T-2 (11).

26. *Smittina trispinosa* var. *munita* (Hincks)

Smittina trispinosa munita Canu and Bassler, 1929. Loc. cit. p. 341, pl. 41, figs. 5, 6.

The zooecia are separated by salient rims. The avicularia are sometimes very large or closely resemble those of *S. trisp. acuta* Canu and Bassler. *Smittina crosslandi* Hastings is distinguished in its narrower lyrula.

Depth. 30-50 fms.

Reg. No. e-T-5 (2).

27. *Smittina reticulata* (MacGillivray)

Smittina reticulata Sakakura, 1935. Loc. cit. p. 26.

Depth. 100 fms.

Distr. Cosmopolitan.

Reg. Nos. e-T-1 (10); e-T-2 (4).

28. *Smittina porifera* (Hincks)

Smittina porifera Sakakura, 1935. Loc. cit. p. 28, pl. 5, fig. 3.

Depth. 150 fms.

Distr. Queen Charlotte Is.

Geol. Occ. Pliocene (New Zealand); Pleistocene (California, Bōsō Peninsula).

Reg. No. e-T-3 (1).

Family Reteporidæ

29. *Iodictyum pacifica* (Robertson)

Retepora pacifica Robertson, 1908. The encrusting Cheilostomatous Bryozoa of the west coast of North America. Univ. of California Publ. Zool. vol. 4, no. 5. p. 310, pl. 24, figs. 81-84.

Phidolopora pacifica Canu and Bassler, 1923. Loc. cit. p. 154, pl. 39, figs. 1-7; O'Donoghue Chas. H. and Elsie O'Donoghue 1926. A second list of Bryozoa (Polyzoa) from the Vancouver Island region. Contr. Canadian Biol. and Fisheries, N. S. vol. 3., p. 72.

Depth. 150 fms.

Distr. Coast of California, Vancouver region.

Geol. Occ. Pleistocene of California and Bōsō Peninsula (?), Japan.

Reg. No. 3-T-9.

30. *Triphyllozoon bimunitum* (Ortmann)

Triphyllozoon bimunitum Harmer, 1934. The Polyzoa of the Siboga Expedition. Part 3. Cheilostomata, Ascophora. I Fam. Reteporidæ. p. 616, pl. 35, fig. 39; pl. 41, figs. 1-8, 11-13; textfig. 25, C, p. 519; textfig. 41, p. 617.

A single colony in which characteristic large avicularia were not found on both dorsal and frontal walls, was obtained.

Depth. 150 fms.

Distr. Japan, Philippine region, Groups A and C of Siboga stations.

Reg. No. e-T-9.

Family Adeonidæ.

31. *Adeonellopsis pentapora* Canu and Bassler

Adeonellopsis pentapora Canu and Bassler, 1929. Loc. cit. p. 382, pl. 53, figs. 1-5; Sakakura, 1935, Loc. cit. p. 29.

Adeonella tuberculata Ortmann, 1889. Loc. cit. p. 53, pl. 4, fig. 9 (not Busk).

The zooecial characters of the basal part of the zoarium coincide well with the figure given by Ortmann as *A. tuberculata*. My specimen encrusts a gastropod shell.

Depth. 100-150 fms.

Distr. Philippine region; Cape Tsuika and Maiduru, Sea of Japan; Sagami Bay, Pacific coast of Japan.

Reg. No. e-T-10.

Family Celleporidæ

32. *Cortazia radiata* (Ortmann)

Cellepora radiata Ortmann, 1889. Loc. cit. p. 56, pl. 1, fig. 14.

Costazia radiata Canu and Bassler, 1929. Loc. cit. p. 432, pl. 63, figs. 8, 9.

Three small colonies which are not ovicelled were obtained.

Depth. 30-50 fms.

Distr. Cape Tsuika and Maiduru, Sea of Japan.

Reg. No. e-T-5.

33. '*Costazia*' *geminata* (Ortmann)

Escharoides geminata Ortmann, 1889. Loc. cit. p. 43, pl. 3, fig. 17; Okada, 1923.

Loc. cit. p. 227, figs. 17, 18.

Costazia geminata Sakakura, 1935. Loc. cit. p. 33.

A single colony. The zooecia are not distinct as Okada's figures.

Depth. 30-50 fms.

Distr. Maiduru and Cape Tsuika, Sea of Japan.

Geol. Occ. Pleistocene of Bōsō Peninsula.

Reg. No. e-T-6.

Order Cyclostomata

Family Tubuliporidæ

34. *Idmonea atlantica* (Johnston)

Tubulipora atlantica Harmer, 1915. The Polyzoa of the Siboga Expedition. Part. I.

Entoprocta, Ctenostomata and Cyclostomata. p. 124, pl. 10, figs. 4, 5.

One colony.

Depth. 30-50 fms.

Reg. No. e-T-5.

35. *Tubulipora pulcherrima* Kirkpatrick

Tubulipora pulcherrima Harmer, 1915. Loc. cit. p. 125, pl. 9, figs. 1-5.

Only one fragment.

Depth. 30-50 fms.

Reg. No. e-T-6.

36. *Tubulipora pulchra* MacGillivray

Tubulipora pulchra Okada, 1928. Cyclostomatous Bryozoa of Mutsu Bay. Sci. Rep.

Tōhoku Imp. Univ. (4) vol. 3, no. 4, fasc. I. p. 489, pl. 4, fig. 3; textfig. 6 a-d.

Some colonies are ovicelled.

Depth. 100 fms.

Reg. No. e-T-1.

37. *Reptotubigera philippae* Harmer

Reptotubigera philippae Sakakura, 1935. Loc. cit. p. 39, pl. 6, fig. 7 and pl. 7, figs. 6, 7.

The lobes are bifurcated with an angle of ca. 120°. 6 or 7 zooecia are not rarely connated. There are scattered small fascicles consisting of 2 or 3 zooecia at the ends of lobes. The zooecia occurring in the interior part of the fascicles are longer than those in the exterior.

Depth. 30-50 fms.

Distr. Philippine region, East Indies.

Geol. Occ. Pleistocene of Bōsō Peninsula.

Reg. No. e-T-6.

Family Lichenoporidae

38. *Lichenopora verrucaria* (Fabricius)

Lichenopora verrucaria Canu and Bassler, 1923. North American Later Tert. and Quat. Bryozoa. p. 205, pl. 44, figs. 8, 9; Okada, 1928. Loc. cit. p. 495.

Somewhat large colonies.

Depth. 100 fms.

Distr. Arctic, Northern Atlantic and N. Pacific, Mutsu Bay (Japan).

Reg. No. e-T-2.

39. *Lichenopora radiata* (Audouin)

Lichenopora radiata Canu and Bassler, 1929. Loc. cit. p. 556, pl. 88, figs. 1-6; Okada, 1928. Loc. cit. p. 494, textfigs. 1-6.

Depth. 30-80 fms.

Distr. Cosmopolitan.

Reg. No. e-T-3; e-T-5.

40. *Lichenopora ? novae-zelandiae* (Busk)

Lichenopora novae-zelandiae Harmer, 1915. Loc. cit. p. 155, pl. 12, figs. 6-11.

One specimen where the ovicell is mostly broken. The cancelli on its roof are much smaller than the ordinary ones. In this point only, my specimen does not agree with Harmer's description.

Depth. 100 fms.

Distr. Western and Southern Pacific.

Reg. No. e-T-2 (12').

February 28, 1935.

EXPLANATION OF PLATE 8

1. *Arachnopusia? kikuchii* sp. nov. $\times 20$.
2. *Emballotheca pellucida* (Ortmann). $\times 20$.
3. *Petraliella elliotti* MacGill. var. *japonica* (Ortmann). $\times 20$.
4. *Lacerna hostensis* Jullien. $\times 20$.
5. *Emballotheca incisa* (Busk). $\times 20$.
6. The same, enlarged.
7. *Lyrula multipora* sp. nov., enlarged.

BRYOZOA FROM TOYAMA BAY
KATUHIKO SAKAKURA

PLATE 8

